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Tresky offers a wide range of application options for ultrasonic DIE bonding

Ultrasonic DIE bonding is a fast, clean and efficient technology increasingly utilized in the semiconductor industry for the assembly of heat sensitive microelectronic DIE's. This method leverages high-frequency ultrasonic vibrations to create a reliable bonds between semiconductor DIEs and substrates, significantly reducing thermal stress. The advantages of ultrasonic DIE bonding include rapid processing times, low temperatures and excellent mechanical strength, making it particularly suitable for advanced applications such as RF components, MEMS and LED packaging.

"The advantages of ultrasonic bonding include low thermal input, short processing times, high mechanical strength and the possibility of joining different materials. This makes the process particularly suitable for advanced modules such as power components, RF components, MEMS and LED housings," explains Daniel Schultze, Managing Director of Tresky GmbH, adding: "Despite the numerous advantages, there are also challenges such as procurement costs, process optimization and material compatibility. However, ongoing research and development efforts in the market and on our part are aimed at solving these challenges and thereby paving the way for a broader introduction and integration of ultrasonic DIE bonding into automated manufacturing processes."

Schultze would therefore like to provide a comprehensive overview of the ultrasonic DIE bonding process, its mechanisms and the possibility of its application in modern semiconductor manufacturing, in order to familiarize the professional community with the advantages of the process. In particular, the demand for smaller, faster, and more powerful electronic devices has led to innovations in semiconductor packaging technology. Ultrasonic bonding has become the method of choice for processing heat-sensitive chips due to its ability to create reliable bonds with minimal thermal stress.

Ultrasonic bonding can therefore be an alternative to thermocompression bonding in flip chip bonding. In flip chip bonding, a row of gold bumps on the bottom side of an IC are connected to gold-plated pads on a substrate. "Pure thermocompression bonding usually requires interface temperatures in the range of ≥ 280 °C. This temperature can damage packaging materials, laminates and some sensitive microchips," says Schultze. Ultrasonic bonding is an alternative to flip chip bonding because the interface temperature and bonding force here are usually between 100 and 160 °C respectively 20 and 50 g/bump and thus cause less material stress. "The high-frequency ultrasonic vibrations generate local heating at the interface between the chip and the substrate, which leads to the formation of a stable bond," Schultze summarizes the process.

Various individual steps are necessary to ensure that the process is carried out reliably. This includes cleaning the surfaces of the DIE and the substrate and preparing them to ensure an optimal bond. The chip is held by a DIE collet, which must be suitable for ultrasonic bonding. After the DIE is aligned on the substrate by the Tresky pattern recognition system, the DIE is precisely positioned and exposed to controlled pressure. The ultrasonic energy that is introduced causes the surfaces to vibrate. These vibrations break up the surface oxides and impurities, enabling contact at the atomic level. The ultrasonic parameters, i.e. power, time and delay, are adjustable in the Tresky DIE Bonder machine software. The combination of pressure and ultrasonic energy creates a solid-state connection, whereby the materials are plastically formed and diffuse. This allows reproducible, stable bonds to be created between the DIE and the substrate.

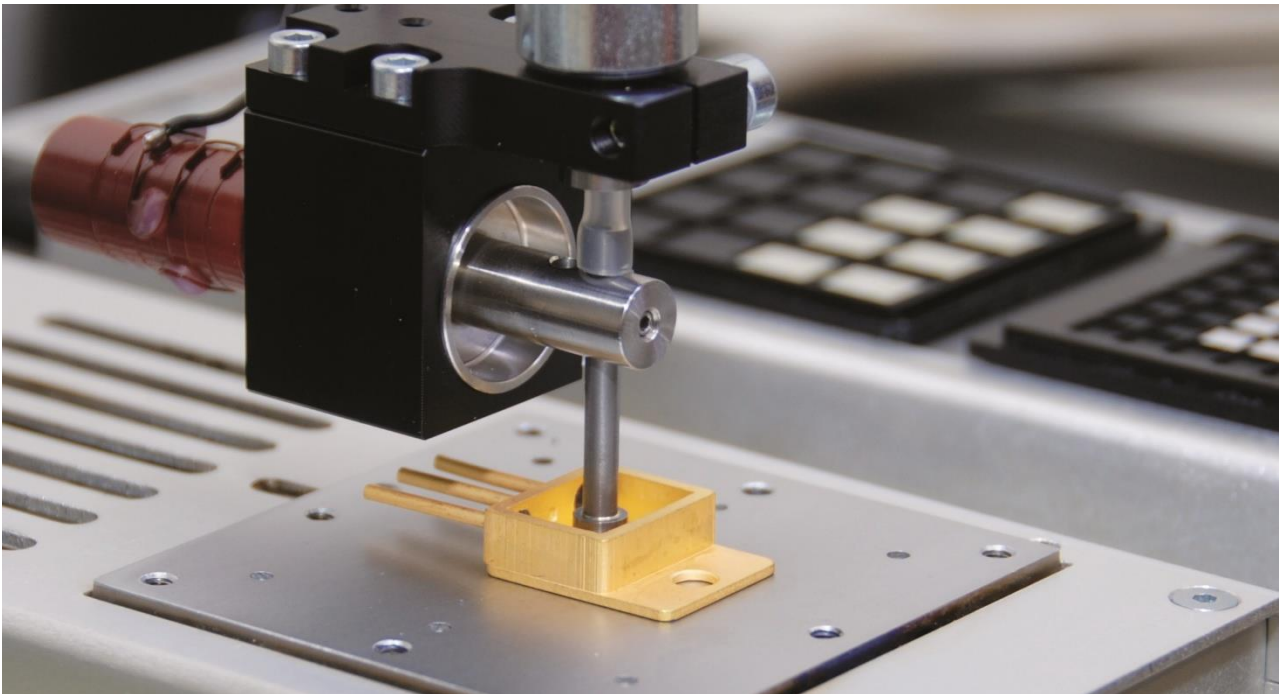
About Tresky

Since 1980 the name TRESKY stands for the highest quality, unmatched flexibility with maximum reliability.

Tresky GmbH is one of the world's leading machine manufacturers for placement systems in the high-precision sector offering more than 40 years of experience in the semiconductor industry. The company is headquartered in Hennigsdorf near Berlin, in the middle of a technology park that is home to numerous highly specialized companies from the automation, electrical engineering, communications technology and life science sectors. Quality "Made in Germany" - Tresky develops, produces and sells Die Bonders from its headquarters in Hennigsdorf.

More information: www.tresky.de/en

Picture:



Picture caption:

Ultrasonic bonding in a Tresky die bonder

Deeplinks:

<https://www.tresky.de/en/products/ultrasonic-bonder/>

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